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Combined temporary
teaching guide for

Seeing through arithmetic 1

Seeing through arithmetic, Practice tablet 1

Seeing through arithmetic 1, Workbook edition

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This is a Temporary Teaching Guide to accompany the first third of the hardbound *Seeing Through Arithmetic 1* (*STA 1*), the *Seeing Through Arithmetic Practice Tablet 1*, and the *Seeing Through Arithmetic 1, Workbook Edition.*

If you are using the hardbound *Seeing Through Arithmetic 1*, you will find teaching notes for each page in the pupil's book indicated by the letters *STA* followed by page number. For example, *STA 1* page 3 indicates that the notes and directions are for page 3 of *Seeing Through Arithmetic 1.* If you are using Practice Tablet 1 along with *Seeing Through Arithmetic 1*, directions for each page in the Practice Tablet will be labeled "Practice Tablet" followed by the Tablet page number. For example, *Practice tablet* page 6 means that the notes and directions are for page 6 of Practice Tablet 1.

If you are using the Workbook Edition, the directions and notes for each page will be labeled "Workbook edition" followed by the page number. For example, **Workbook edition** page 19 indicates that the notes and directions are for page 19 of *Seeing Through Arithmetic 1, Workbook Edition.*

This temporary Guide will be superseded during the school year 1964-1965 by permanent teacher's editions. The Teacher's Edition for *Seeing Through Arithmetic 1* will be a hardbound book of 528 pages. It will show, in full size and color, each page from *Seeing Through Arithmetic 1.* Complete teaching notes will be printed at the right on the page facing the page from the pupil's book. Responses for all exercises will be indicated on the reproduced pupil's page. Pages from the Tablet will be reproduced in slightly less than full size and will show all responses. The directions for the Tablet page will be printed beneath the reproduction of the pupil's page.

The Teacher's Edition for the Workbook Edition will be a paperback of 448 pages. It will show all the teaching pages in full size and color with all responses indicated on the reproduced page. Complete notes and directions for teaching the pupil's page will be printed at the right on the page facing the page from the pupil's book. The practice pages will be slightly reduced in size, with all responses shown. Directions for using the practice page will be given beneath the reproduced pupil's page.

GEOMETRY

The geometric ideas presented in grades 1 and 2 are related to the world with which children are familiar. The presentation is informal and intuitive, but is developed in such a way that later learning of precise mathematical definitions will be facilitated.

In grade 1, the children learn to identify an open curve and a closed curve. They also learn certain properties of these curves. In grade 2, the children extend their knowledge of open curves and the properties of open curves to include the ideas of lines, line segments, and relationships between lines. They extend their knowledge of closed curves and the properties of closed curves to include polygons.

The development of each geometric idea follows the same sequence. The idea is first related to physical situations that are familiar to children. Then the idea is presented as an abstraction from the physical world. The learning experiences go from the "concrete" to the "abstract."

STA 1 page 3
Workbook edition page 1

Introduction to the idea of closed curves and open curves

Children in the first grade begin their study of geometry by developing an informal

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and intuitive notion of curves. They discover two types of curves and learn that these curves are called open curves and closed curves.

In each of the pictures on this page, a path is used to represent a curve. Direct attention to each of the pictures. Have the children tell what they see in each picture and what similarities and differences they observe.

After discussion of the pictures has been completed, direct attention to the top picture. Suggest that the children pretend they are going to take a walk along the path. Tell them that they may trace the path with their fingers. The children should select various objects along the path as the starting point for their walk. They should also suggest the direction in which they are going to walk.

Suppose one of the children suggests that they should start their walk at the bench and walk toward the drinking fountain. As they walk along the path, they will pass the drinking fountain, go over a bridge, pass the tree, pass the flower garden, go over the other bridge, and then come back to the bench. Someone else might suggest that they start their walk at the flower garden and walk toward the tree. This time they will pass the tree, go over a bridge, pass the drinking fountain, pass the bench, go over the other bridge, and come back to the flower garden.

After several more walks have been taken along the path, the children will discover that, no matter where they begin their walk, they can walk completely around the path and arrive back at the place they started from without retracing any part of the path.

Now direct attention to the bottom picture. Suggest again that the children take a walk along the path. Let them select various objects along the path as starting points. If they start at the bench and go toward the drinking fountain, they pass the drinking fountain, but then they come to a high fence that blocks the path. To get back to the bench, they must go back the same way they came. Suppose they next start at the drinking fountain and go toward the bench. This time they pass the bench, go over the bridge, pass the flower garden, and pass the tree, but again they come to a high fence. To get back to the bench, they must return the same way they came.

After several more walks have been taken along the path, the children will discover that, no matter where they start, they will always have to retrace the path in order to get back to the place they started from.

Now have the children talk about how the path in the top picture differs from the path in the bottom picture. Tell them that the path in the top picture represents a *closed curve* and the path in the bottom picture represents an *open curve*. Discuss why the paths in these pictures represent a closed curve and an open curve.

STA 1 page 4
Workbook edition page 2

Identification of closed curves and of open curves

The children continue to identify closed curves and open curves that are represented by objects in physical situations. They begin to tell why the object represents either a closed curve or an open curve.

On this page a driveway and a river are used to represent open curves. A sidewalk around a block and a railroad track are used to represent closed curves. The pictures can be considered in any order. Discuss each picture completely before going to the next one. The objects pictured in a specific picture can serve as a means of identifying the picture.

For each picture, have the children tell what they see. Next, let them pretend that

they are going to walk or ride along the path represented. Any one of the various objects along the path may be used as a starting point. As the children move along the path, they should name each of the objects passed. They should decide if they can return to the starting object without retracing the path. Several walks or rides should be taken along each path represented. Then have the children decide which the path represents, a closed curve or an open curve, and tell why they think as they do.

For the driveway and the river, the children should say that the path represents an open curve because they *cannot* get back to the starting place without retracing the path. For the sidewalk and the railroad track, the children should say that the path represents a closed curve because they *can* get back to the place they started from without retracing the path.

STA 1 page 5

Identification of closed curves and of open curves

The children identify closed and open curves represented by paths that are abstractions from physical situations.

The pictures can be considered in any order. Discuss each picture completely before going on to the next. One way to indicate a specific picture is to name the background color of the picture and the row (top, middle, bottom) in which the picture is located. For example, "the picture with the yellow background, in the top row" identifies the picture in the upper left corner of the page.

Have the children find the picture with the pink background in the middle row. Ask them to name something they have seen that is suggested by the pictured curve. The children might suggest either the driveway or the river shown on *STA 1* page 4. Encourage them to name objects that are not shown in the book.

Then have the children trace the path with their fingers. They should trace the path several times and in both directions. Ask them to tell what kind of curve they think is represented and to explain why they think as they do.

Follow a similar procedure for each of the other pictures.

Practice tablet page 1
Workbook edition page 3

Call attention to the clowns. Say: "The clown with his hat on is happy because he found his hat. The clown without his hat is sad because he did not find his hat. On this page you are looking for open curves. If a path shows an open curve, you will be happy. If a path does not show an open curve, you will be sad."

Now direct attention to the picture at the left in the top row. Say: "Put your pencil (or crayon) on the dot. Trace the path. [The child may trace from the dot to either end of the path.] Can you get back to the dot without going back over any part of the path? [No] Does this path show an open curve? [Yes] Did you find what you were looking for? [Yes] Are you happy or sad? [Happy] Since you are happy, draw a ring around the happy clown."

Have the children do each of the other pictures in the same way. Tell them that if a path shows an open curve, they are to draw a ring around the happy clown. If a path does not show an open curve, they are to draw a ring around the sad clown.

Practice tablet page 2
Workbook edition page 4

Say: "On this page you are looking for closed curves. If the path shows a closed

curve, you will be happy. If the path does not show a closed curve, you will be sad."

Direct attention to the picture at the left in the top row. Say: "Put your pencil (or crayon) on the dot. Trace the path. Can you get back to the dot without going back over any part of the path? [Yes] Does the path show a closed curve? [Yes] Did you find what you were looking for? [Yes] Are you happy or sad? [Happy] Since you are happy, draw a ring around the happy clown."

Have the children do each of the other pictures in the same way. Tell them that if a path shows a closed curve, they are to draw a ring around the happy clown. If a path does not show a closed curve, they are to draw a ring around the sad clown.

STA 1 page 6
Workbook edition page 5

Introduction to the idea of interior and exterior for simple closed curves

The children learn that, while a closed curve has an inside and an outside, an open curve does not have an inside or an outside.

Mathematically, a closed curve has an interior rather than an inside, and an exterior rather than an outside. However, children in grade 1 have an intuitive notion of inside and outside from their own experiences. Consequently, the more meaningful words "inside" and "outside" are used at this level.

Have the children tell what they see in each picture. Have them tell what kind of curve is represented by each fence.

Next direct attention to the top picture and have the children identify the curve represented by the fence as a closed curve. Ask them if the dog can get the ball without crossing the fence. If a child suggests that the dog could jump over or crawl under the fence, it must be pointed out that the dog would still be crossing the fence. Have the children observe that the dog is inside the fence, and that the ball is outside the fence.

Next ask if the dog can get to his dish without crossing the fence. The children should observe that the dog, the dish, and the doghouse are inside the fence. Then have the children explain how they know that these objects are inside the fence. They should say that the dog can get to the doghouse and to the dish without crossing the fence. Finally, have the children tell what objects are inside and what objects are outside the closed curve represented by the fence.

Direct attention to the bottom picture. Have the children identify the curve represented by the fence as an open curve. Ask the children if the cat can get the ball without crossing the fence. Point out that, since the cat can get the ball without crossing the fence, they *cannot* say that the ball is inside and the cat is outside the fence.

Have the children compare the two pictures again. They should understand that the closed curve represented in the top picture has an inside and an outside because the dog cannot get outside without crossing the curve. They should also understand that, if a curve is open, it has neither an inside nor an outside.

STA 1 page 7
Workbook edition page 6

Identification of the inside and outside of curves

The children continue to study the inside and outside of curves.

On this page a path, a fence, and a sandbox are used to represent closed curves. A boat dock is used to represent an open curve. Discuss each picture completely before going on to the next one.

For the picture showing the squirrels, the children should discuss what they see and identify the curve represented by the path. They should observe that the squirrels cannot get to the tree without crossing the path. They should decide that the squirrels are inside and the tree is outside the curve represented by the path.

For the picture showing the boat, the children should discuss what they see and identify the curve represented by the boat dock. They should observe that the boat can be moved to the boathouse without crossing the dock. They should decide that the curve represented does not have an inside or an outside.

For each of the other pictures, have the children discuss what they see and what type of curve is represented. Have them decide which objects are inside each curve represented and which objects are outside.

Be sure the children understand that a closed curve has an inside and an outside, but that an open curve has neither an inside nor an outside.

STA 1 page 8

Identification of the inside and outside of curves

The children identify closed and open curves represented by paths that are abstractions from physical situations. They decide whether the colored dots are inside or outside the curves represented.

The pictures can be considered in any order. Discuss each picture completely before going on to the next. One way to indicate a specific picture is to name the color that identifies the piece of paper and the row (top, middle, bottom) in which the picture is located. For example, "the picture with the yellow top in the bottom row" identifies the picture in the lower right corner of the page.

Have the children find the picture with the pink top in the top row. First ask what kind of curve is shown. Then have them trace an imaginary path from the red dot to the blue dot or from the blue dot to the red dot. Ask them if they had to cross the curve represented. Since they had to cross the curve, they can decide that the blue dot is inside and the red dot is outside the curve represented.

Follow a similar procedure for each of the other picture on this page. For each open curve represented, the children should say that they cannot tell whether a dot is inside or outside because an open curve does not have an inside or an outside. For each closed curve represented, they should identify the dots that are inside and the dots that are outside the curve represented.

Practice tablet page 8
Workbook edition page 7

Say: "On this page you are looking for closed curves. If a path shows a closed curve, you will be happy. If a path does not show a closed curve, you will be sad."

Direct attention to the picture at the left in the top row. Say: "With your pencil (or crayon) trace the path. Does the path show a closed curve? [Yes] Did you find what you were looking for? [Yes] Are you happy or sad? [Happy] Since you are happy, draw a ring around the happy clown. Does a closed curve have an inside? [Yes] Put a dot inside the closed curve."

Have the children do each of the other pictures in the same way. Tell them that if a path shows a closed curve, they are to draw a ring around the happy clown and put a dot inside the closed curve. If the path does not show a closed curve, they are to draw a ring around the sad clown.

Practice tablet page 4
Workbook edition page 8

Say: "On this page you are looking for closed curves. If a path shows a closed curve, you will be happy. If the path does not show a closed curve, you will be sad."

Direct attention to the picture at the left in the top row. Say: "With your pencil (or crayon), trace the path. [The child may trace from the dot to either end of the path.] Does the path show a closed curve? [No] Did you find what you were looking for? [No] Are you happy or sad? [Sad] Around which clown should you draw a ring? [The sad clown] Draw a ring around this clown. Can you put a dot so that it is outside the path? [No]"

Have the children do each of the other pictures in the same way. Tell them that if a path shows a closed curve, they are to draw a ring around the happy clown and put a dot outside the closed curve. If a path does not show a closed curve, they are to draw a ring around the sad clown.

STA 1 page 9
Workbook edition page 9

Introduction to the idea of betweenness for curves

The children learn that if a path represents an open curve, an object is between two other objects in the path. They also learn that, in the mathematical world, if a path represents a closed curve, there is no betweenness for objects in the path.

The concept of betweenness is introduced because it is basic in the development of such important mathematical ideas as order and separation. Betweenness for an open curve is a rather intuitive notion and can be easily related to the physical world. For example, in discussing the top picture, children will readily accept the statement that the lamppost is between the car and the house because it is necessary to pass the lamppost in walking from the car to the house or from the house to the car.

Difficulty arises, however, in considering betweenness for a simple closed curve. For example, in the bottom picture on this page, when we think of the path as a simple closed curve, we say the lamppost is not between the house and the car because it is possible to walk from the house to the car without passing the lamppost. Keep in mind that in this situation we are thinking of the path as a simple closed curve.

Direct attention to the top picture. Have the children tell what they see. Have them identify the curve represented by the path as an open curve. Suggest that they pretend they are taking a walk along the path, starting at the house. Tell them to trace the path with their fingers and to name each object they pass as they move along the path toward the car. Then ask them to trace the path from the car to the house and to name each object they must pass.

Ask the children if they must pass the tree as they walk along the path from the house to the birdbath. Tell them that the tree is *between* the house and the birdbath because they must pass the tree to go from the house to the birdbath. Now ask them if they must pass the lamppost as they walk along the path from the car to the birdbath. Next ask them what object is between the car and the birdbath. Then have the children explain why the birdbath is between the lamppost and the tree. Remind the children that the path in the picture represents an open curve. They should understand that, if a path represents an open curve, they can always say that an object is between certain other objects along the path.

Next direct attention to the bottom picture. Have the children tell what they see. Have them identify the curve represented by

the path as a closed curve. Suggest that the children trace the path from the house to the car. Tell them to follow the path so that they pass the lamppost. Ask them if they can walk along the path from the car to the house without passing the lamppost. The children should observe that they can get to the house from the car by walking along the path, passing the bush and the flower bed, without passing the lamppost. Tell them that they *cannot* say that the lamppost is between the house and the car because they can get from the car to the house or from the house to the car without passing the lamppost. Remind them that the path in the bottom picture represents a simple closed curve.

Ask the children if they can get from the bush to the house without passing the flower garden. Then ask them if the flower garden is between the bush and the house. The children should understand that, since they can get from the bush to the house without passing the flower garden, they cannot say that the flower garden is between the bush and the house. After several more trips have been taken along the path, the children should understand that, when a path represents a simple closed curve, they cannot say that an object along the path is between other objects along the path.

Have the children again discuss the paths represented in the two pictures. Remind them that the path in the top picture represents an open curve and the path in the bottom picture represents a closed curve. Then have them discuss why they can say that the lamppost is between the car and the house in the top picture, but they cannot say that the lamppost is between the car and the house in the bottom picture. They should understand that, if they must pass the lamppost when walking from the car to the house, the lamppost is between the car and the house. They should also understand that if they can walk from the car to the house without passing the lamppost, they cannot say the lamppost is between the car and the house.

STA 1 page 10
Workbook edition page 10

Betweenness for curves

The children continue to study the idea of betweenness for curves. A river, a railroad track, and a stone walk are used to represent open curves. A sidewalk around a block is used to represent a closed curve. Discuss each picture completely before going on to the next one. The names of the objects pictured may be used to identify the picture.

Direct attention to the picture of the river. Have the children identify the curve represented by the river as an open curve. Ask them if the house is between the bridge and the tree. They should decide that, since it is not possible to sail from the tree to the bridge, or from the bridge to the tree, without passing the house, the house is between the tree and the bridge. Then have them decide what object in the picture is between the bridge and the house. Again they should see that they cannot sail from the bridge to the house, or from the house to the bridge, without passing the flower bed. In a similar way, they should determine that the house is between the tree and the flower bed.

Next direct attention to the picture that shows a sidewalk. Ask the children if the bench is between the house and the water fountain. They should decide that, because it is possible to walk from the house to the water fountain without passing the bench, they cannot say that the bench is between the house and the water fountain. Then ask them if the water fountain is between the bench and the lamppost. They should decide that they cannot say that the water fountain is between the bench and the lamppost. Explain that, since the sidewalk represents a closed curve, they

cannot say that any of the objects along the sidewalk are between other objects.

Follow a similar procedure for the picture showing the railroad track and the picture showing the stone walk. The children should understand that, if a path represents an open curve, they can determine that some objects are between other objects along the path.

STA 1 page 11

Betweenness for curves

The children identify closed and open curves represented by paths that are abstractions from physical situations. They decide if a colored dot is between other colored dots in the curves represented.

The pictures can be considered in any order. Discuss each picture completely before going on to the next. Identify each picture by naming the color at the top of the piece of paper and the row in which the picture is located. For example, have the children find the picture that has yellow at the top in the top row. First have them identify the curve represented in this picture as an open curve. Then tell them to trace an imaginary path on the curve represented. Ask them if they can trace a path from the yellow dot to the red dot, or from the red dot to the yellow dot, without passing the blue dot. Since they must pass the blue dot, they can say that the blue dot is between the red dot and the yellow dot.

Follow a similar procedure for each of the other pictures on this page. For each open curve that is represented, they should tell which dot is between two other dots. For each closed curve that is represented, they should say that they cannot say that a dot is between other dots in the curve.

Practice tablet page 5
Workbook edition page 11

Say: "On this page you are looking for open curves. If the path shows an open curve, you will be happy. If the path does not show an open curve, you will be sad."

Call attention to the picture at the left in the top row. Say: "With your pencil (or crayon), trace the path. [The child may trace from one of the dots to either end of the path.] Does the path show an open curve? [Yes] Did you find what you were looking for? [Yes] Are you happy or sad? [Happy] Around which clown should you draw a ring? [The happy clown] Draw a ring around this clown. Can you put a dot on this path so that it is between the other dots? [Yes] Put a dot so that it is between the other dots on the path."

Have the children do each of the other pictures in the same way. Tell them that if a path shows an open curve, they are to draw a ring around the happy clown and put a dot between the other dots on the path. If the path does not show an open curve, they are to draw a ring around the sad clown.

Practice tablet page 6
Workbook edition page 12

Say: "On this page you are looking for open curves. If the path shows an open curve, you will be happy. If the path does not show an open curve, you will be sad."

Call attention to the picture at the left in the top row. Say: "With your pencil (or crayon), trace the path. Does the path show an open curve? [No] Did you find what you were looking for? [No] Are you happy or sad? [Sad] Around which clown should you draw a ring? [The sad clown] Draw a ring around this clown. Can you put a dot so that it is between the dots on the path? [No]"

Have the children do each of the other pictures in the same way. Tell them that if a path shows an open curve, they are to draw a ring around the happy clown and put a dot between the other dots on the path. If the path does not show an open curve, they are to draw a ring around the sad clown.

CARDINAL IDEA OF NUMBER

The question "How many?" calls for a quantitative answer, for example, "five children," "two kittens" or "three marbles." Such answers involve the cardinal idea of number. This concept of number is concerned with the numerousness of a set of objects and is not dependent upon the idea of counting. It grows out of the ideas of one-to-one correspondence and equivalence for sets. (*Set* is a mathematical term that refers to a group, or collection, of objects.) A one-to-one correspondence is a special matching, or pairing, between two sets in which each member of a given set of objects matches (or corresponds to) one member of a second set, and each member of the second set matches one member of the given set. When the members of sets can be placed in one-to-one correspondence, the sets have the same number of members and are called equivalent sets.

One-to-one correspondence for sets is a basic idea that leads to the development of equivalence for sets and to the idea of number as a common property, or characteristic, of equivalent sets. Think about the set whose members are three boys (Tom, Dick, and Harry) and all sets equivalent to this set. These sets have a common property, the same number of objects, namely, three. The physical nature of the objects in each set is disregarded, but the concept of number remains.

The first two lessons in this part of the pupil's book deal with ideas of "many" and "few." Following this, the children learn to recognize sets that are associated with numbers. A set containing one or two members may appear insignificant. Therefore, to give meaning to the ideas of correspondence and equivalence, a set containing three members is introduced first, followed by a set of four objects, then one and two objects. Eventually, by grouping and regrouping, children learn to recognize the number of objects in sets that contain 5, 6, 7, 8, 9, and 10 objects.

The idea of correspondence is again used to introduce children to the ideas of "greater than," "less than," order, and betweenness for the numbers through ten.

STA 1 page 12
Workbook edition page 13

Introducing the ideas of many and few

The children begin their study of the cardinal idea of number by considering sets in which the number of objects may be described by the words "many" or "few."

The ideas expressed by these words are crude number concepts that are presented before more precise ideas of number are introduced. Children in grade 1 are usually able to recognize that a set contains "many" or that it contains "few" objects.

Discuss informally the general ideas of many and few. Ask the children to name things in the classroom, at home, and out of doors that make them think of "many." If they have difficulty, help them by suggesting the drops of rain during a rainstorm, the leaves on the ground in autumn, or the number of shoes the children in the classroom are wearing. Give each child an opportunity to name a set of objects that means "many" to him and to explain the reasons for his choice.

Care should be taken to develop a clear understanding of the terms that are used. If this is done, any one of the words "group," "collection," or "set" may be used in talking

with children, but it would be advisable to select and use one of these when the idea of set is first introduced. If "group" or "collection" is selected, make the transition to "set" as soon as the children indicate a readiness for the change in terminology.

When you are satisfied that all the children understand the use of the word "many," ask them to name things that make them think of "few." Let each child name at least one set of objects and explain why it means "few" to him.

For this page, provide each child with two markers of different colors.

Have the children talk about the pictures at the top of the page. One of the pictures shows many cows. Tell the children to place a marker on the picture that shows many cows. Check to see that they have placed their markers correctly. One of the pictures shows few cows. Tell them to place a different marker on the picture that shows few cows. Discourage pupils from counting the number of cows. Check to see that they have placed their markers correctly.

In a similar way, discuss the pictures at the bottom of the page. (The picture that shows the moon may be used as the picture that shows "many" stars.)

Encourage the children to use the words "many" and "few." Hold up your book, point to one of the pictures, and ask the children to describe the picture. A child might say that a picture shows many (or few) cows, or that a picture shows many (or few) stars.

STA 1 page 13
Workbook edition page 14

Ideas of many and few

The children continue to react to situations that involve the ideas of many and few. They learn that these ideas are relative; many objects in one situation may be thought of as few objects in another situation.

For this page, provide each child with two markers. Have the children look at the pictures of the marbles at the top of the page. Tell them to imagine that Tom and Dick are playing marbles. One of the pictures shows few marbles. Tell them to place a marker on the picture that shows few marbles. Check to see that the children have placed their markers correctly. Now tell them to place a marker on the picture that shows many marbles, and check to see that this is done correctly.

Then have the children imagine that all the boys in the class (or in the school, if the class has few boys) are playing marbles. Ask them which of the pictures represents few marbles in this situation. They should understand that in this situation both pictures represent few marbles.

The remaining pictures on the page can be considered in any order. Identify each picture by the kind of object in the picture. Discuss each picture completely before going on to the next. For each picture, have the children suggest a situation in which the objects might suggest many things and a situation in which the objects might suggest few things.

If the children have difficulty, help them by telling them that if Bob and Jane are playing with the toys, the picture suggests many toys, but if all the children in the school are playing with the toys, the picture suggests few toys. Also, if Pat is going to put the books away, there are many books, but if all the boys in the room are going to put the books away, there are few books, and so on.

Practice tablet page 7
Workbook edition page 15

Say: "On this page you are looking for pictures that show many objects. If a

picture shows many objects, you will be happy. If a picture shows few objects, you will be sad."

Direct attention to the picture at the left in the top row. Say: "Are there many cookies or few cookies in this picture? [Many cookies] Did you find what you were looking for? [Yes] Are you happy or sad? [Happy] Around which clown should you draw a ring? [The happy clown] Draw a ring around this clown."

Have the children do each of the other pictures in the same way. Tell them that if a picture shows many objects, they are to draw a ring around the happy clown. If a picture shows few objects, they are to draw a ring around the sad clown.

A child's response may not agree with the one given for a picture. If this should occur, accept any response that the child can justify.

Practice tablet page 8
Workbook edition page 16

Say: "On this page you are looking for pictures that show few objects. If a picture shows few objects, you will be happy. If a picture shows many objects, you will be sad."

Direct attention to the picture at the left in the top row. Say: "Are there many flowers or few flowers in this picture? [Few flowers] Did you find what you were looking for? [Yes] Are you happy or sad? [Happy] Around which clown should you draw a ring? [The happy clown] Draw a ring around this clown"

Have the children do each of the other pictures in the same way. Tell them that if a picture shows few objects, they are to draw a ring around the happy clown. If a picture shows many objects, they are to draw a ring around the sad clown.

A child's response may not agree with the one given for a picture. If this should occur, accept any response that the child can justify.

STA 1 page 14
Workbook edition page 17

Introduction of the number three

The children learn that they can determine if there are as many objects in a certain set as there are in a master set. They learn to recognize sets of three objects without counting.

On some pages that deal with the cardinal idea of number, it is necessary for the children to identify a specific set of objects. This set is made up of colored disks and is called the master set. On this page, the master set is made up of orange disks and is repeated in each of the pictures.

In each picture, "lines" are used to pair the disks with the objects. "Lines," as used here, does not relate to the geometric notion of line, but is used as a convenient name for a device.

Direct the children's attention to the first picture, which shows a set of disks. Tell them that this set of disks is a master set and that it will be used in talking about the pictures on this page. *Do not name the number of the master set as "three" at this time.* The children should observe that there are other sets of disks on the page.

Next tell the children to look at the picture that shows the master set and the set of train engines. Have them trace each line with their fingers. They should observe that there is an engine for each disk and a disk for each engine. Ask the children if there are as many engines as disks. They should decide that there are as many engines as disks.

Follow this procedure for each of the other pictures. When discussing the picture of the horns, emphasize that there are not as many horns as disks. Avoid naming the set number of the set of horns as "two," although a child may suggest this name.

After all the pictures have been discussed, identify the master set as having three

objects. Explain that "three" tells "how many" things there are in this set and that each set that has as many members as the master set has three objects. Then have the children identify the number of each set of objects on the page as "three" or "not three."

Show the children other sets that have three objects. Have them build many different sets of three by using markers and other objects at their desks.

STA 1 page 15
Workbook edition page 18

Introduction of the number four

The children continue to use the idea of a one-to-one correspondence to determine if there are as many objects in certain sets as there are in a master set. They learn to recognize a set of four objects without counting.

Identify the set of brown disks (Wkbk, blue) * as the master set. Do not, at this time, discuss the number of objects. Have the children trace each line with their fingers. For the picture of the dolls, they should determine that there are as many dolls as there are disks. After the children have described the numerousness of each group by using the words "as many as" or "not as many as," identify the master set as having four objects. Next, have them identify each set as having "four" or "not four" objects.

Then tell the children to look again at the picture of the doll dresses. Ask them how many dresses there are. Some of the children may have anticipated this question during the earlier discussion. They should decide that there are three dresses in the set.

The children should be shown other sets that contain four objects, and they should build many sets themselves.

*Some color references and most page references are not the same in the Workbook Edition (Wkbk) as in the Seeing Through Arithmetic (STA 1) book. When color or page references are different from those in STA 1, they will be inserted in the text within parentheses.

STA 1 page 16
Workbook edition page 19

Introduction of the number one and the number two

The children continue to match objects in certain sets with a master set to determine if the sets have the same number of members. They learn to recognize a set containing one object and a set containing two objects.

Note that there are two teaching sequences on this page, one introducing the number one and the other introducing the number two. In the first sequence, identify the green disk (Wkbk, blue) as the master set, and have the children match the objects in each set with the disk in the master set. Then identify the master set containing a green disk as "one," and have the children name each set of objects in the first teaching sequence as "one" or "not one." Follow a similar procedure for the sequence of pictures that introduces the number two.

Tell the children to look at the picture of the boxes. Ask them if they can tell how many boxes are shown. Some of the children may anticipate this question during the earlier discussion. Since they have been introduced to the idea of four, they should be able to identify the set of boxes as having four objects.

The children should be shown other sets that contain one or two objects, and they should build many sets themselves.

Practice tablet page 9
Workbook edition page 20

Direct attention to the picture of the airplanes. Have the children look at the three sets of disks that are shown in the picture.

Then say: "Only one of the sets of disks can be matched with the set of airplanes.

Find this set. Is there a disk for each airplane and an airplane for each disk? [Yes] Draw a ring around this set.

"For each of the other pictures, find the set of disks that can be matched with the set of objects shown in the picture. Draw a ring around this set."

Some children may have trouble selecting the correct set. If this difficulty arises, show them how to do the matching by drawing a line from an object to a disk.

STA 1 page 17
Workbook edition page 21

Introduction of printed words and symbols for 1, 2, 3, and 4

On this page, the children recognize the numerousness of a set of objects. Then they learn to associate and to identify the word and the symbol that name this number.

A number is a mathematical idea. Words and symbols such as four, 3, two, and so on, are names for numbers. Such names are called *numerals*. Since a numeral names a number, both "four" and "4" are numerals. It is important that the children begin to understand the difference between number and numeral. Therefore, in class discussion, maintain the distinction between the number associated with a set and the names of this number. However, do not require the children to make this distinction.

Observe the four teaching sequences that introduce the following words and symbols: three and 3, one and 1, four and 4, two and 2. This order is deliberate because we are not, at this time, concerned with counting. We want the children to develop instant recognition of the numerousness of a set, not to rely on counting the members of a set.

In each teaching sequence, two sets of one to four objects are pictured. The numerals that name the number in each set are printed in the first part of each picture.

Direct attention to the drums in the first picture. Have the children decide how many drums there are. Introduce the word "three" and the symbol "3" as names for the number associated with the set of drums. Use your established reading technique in introducing words and symbols. Then have the children determine that there are as many tops as drums and decide how many tops there are. Have them select, from the lists at the top of the page, the numerals associated with the set of tops. Note the colored marks under each numeral. These marks can be used as a means of identification. For example, a child might respond by saying that there are three tops and that there is a green mark (Wkbk, orange) under this word. Follow similar procedures in introducing the words and symbols for 1, 4, and 2.

As a final activity, discuss the four pictures at the bottom of the page. For each picture, the children should tell the number of objects in the set and find the numerals for this number in the lists at the top of the page.

STA 1 page 18

The printed words and symbols for 1, 2, 3, and 4

The children are given further experiences in recognizing numerousness of sets and in identifying numerals that name the numbers associated with these sets.

Observe the four pictures at the top of the page. For those children who are ready for writing activities, these pictures may be used to give them experience in writing the numerals 1, 2, 3, and 4.

The other six pictures on the page may be discussed in any order. For each picture, have the children tell how many objects are in the set and what word and symbol name the number.

If some children cannot name the colors of the dots, provide them with pieces of colored paper. These colors should closely match the colors of the dots. A paper of the correct color can be held up as a response. For example, for the picture of hats, a child might hold up the green paper to identify the symbol "3" and the blue paper to identify the word "three."

Also provide each child with a set of eight cards. On four of the cards, write the numerals 1, 2, 3, and 4, one numeral to each card. On the other four cards, write the words "one," "two," "three," and "four," one word to each card. One of these cards can be held up as a response to a question concerning the numerousness of each set pictured.

Practice tablet page 10
Workbook edition page 22

Call attention to the picture of the clown. Say: "How many clowns are there? [1] Find the word that tells how many clowns there are. Draw a ring around this word. Find the numeral that tells how many clowns there are. Draw a ring around this numeral.

"For each of the other pictures, decide how many objects there are. Next draw a ring around the word that tells how many objects there are. Then draw a ring around the numeral that tells how many objects there are."

Practice tablet page 11
Workbook edition page 23

Call attention to the picture of the cars. Say: "How many cars are there? [3] Find the word that tells how many cars there are. Draw a ring around this word. Find the numeral that tells how many cars there are. Draw a ring around this numeral.

"For each of the other pictures, decide how many objects there are. Next draw a ring around the word that tells how many objects there are. Then draw a ring around the numeral that tells how many objects there are."

Practice tablet page 12
Workbook edition page 24

Direct attention the top row of response lines. Say: "Look at the arrow beside the numeral 1. This arrow tells you where you should begin to write the numeral 1. It also tells in which direction you should move your pencil. With your pencil trace each numeral that is given. Then write the numeral 1 on each of the other response lines in the row. The numerals that you write should look like the numeral 1 that is shown below the whistle.

"Do each of the other rows in the same way. With your pencil trace the numeral at the beginning of a row. Then write this numeral on each of the other response lines in the row. The numerals you write should look like the numerals that are shown below the whistles."

Practice tablet page 13
Workbook edition page 25

Direct attention to the picture of the boats. Say: "How many boats are there? [2] On the response line, write the numeral that tells how many boats there are.

"For each of the other pictures, decide how many objects there are. On the response line, write the numeral that tells how many objects there are."

Practice tablet page 14
Workbook edition page 26

Say: "For each picture, decide how many objects there are. On the response line, write the numeral that tells how many objects there are."

STA 1 page 19
Workbook edition page 27

Introduction of the ideas of "greater than" and "less than." Oral use of the words "is greater than" and "is less than"

Now that the children can recognize that certain sets have as many objects as other sets, they are ready to compare numbers and to study the related ideas of "greater than" and "less than."

In mathematics, the ideas of "greater than" and "less than" are relations of inequality. Certain language distinctions associated with the ideas of inequality should be maintained in class discussion, but they should not be required from the children. These distinctions may be expressed as follows: "There are *more* (or *fewer*) objects in one set than in another set" and "One number *is greater than* (or *is less than*) another number." "More" and "fewer" are used when talking about objects. "Greater" and "less" are used when comparing numbers.

Before children are introduced to mathematical symbols they should have a thorough understanding of what the symbols mean. The use of symbols does not, in itself, help children understand the basic idea involved and may actually create confusion and hinder understanding. Also, extensive practice with the symbols should follow their introduction. Since some mathematical symbols, such as ">" for "is greater than" and "<" for "is less than," have very limited use at the elementary level, there is no practical value in introducing these symbols at this time.

The objects belonging to a set are sometimes called "members" of the set. This term is used in these teaching notes, but it should not be used with the children at the present time.

Direct attention to the picture that shows the basket and the cups. Point out that two sets of objects are pictured, and say: "Look at the set of cups. Does this set have more objects in it than the set of baskets?" Since the children have had many social experiences with the idea of "more," they will see that there are more cups than baskets. Then explain that there is another way of thinking about these two sets. "We can also say that there are fewer baskets than cups." If the children have trouble with this idea, compare various sets of classroom objects (blackboard erasers, children, etc.). Use sets that are not associated with the same number. Emphasize the idea that one set contains more (or fewer) objects than the other set. *Do not,* at any point in this lesson, ask *how many more* or *how many fewer* objects there are in one set than in another.

Now have the children give "one" as the number of baskets in the set of baskets and "four" as the number of cups in the set of cups. Tell them that one is *less* than four and that four is *greater* than one. Continue the development of this idea by using sets of classroom objects until the children are thoroughly familiar with the idea that 4 is greater than 1 and that 1 is less than 4. Do not be unduly disturbed if the children say "4 is more than (rather than *greater than*) 1." Preciseness of language will develop slowly, but it will come if your language is precise.

Activities similar to those just described should be used for each of the other pictures on this page. Proceed slowly and carefully, and reinforce the ideas by activities with actual objects. Do not leave the page until you are reasonably sure that children understand "fewer than" and "more than" as related to sets of objects and "less than" and "greater than" as related to numbers.

Practice tablet page 15
Workbook edition page 28

Say: "On this page, you are looking for pictures that show more toys than spools. If

there are more toys than spools, you will be happy. Around which clown will you draw a ring? [The happy clown] If there are fewer toys than spools, you will be sad. Around which clown will you draw a ring? [The sad clown]"

Call attention to the picture of the spools and the pails. Say: "Match each spool with a pail. To do this, draw a line from a spool to a pail. [If necessary, show the children how to match the objects.] Have you used all the spools in the matching? [Yes] Have you used all the pails in the matching? [No] Are there more pails than spools? [Yes] Around which clown should you draw a ring? [The happy clown] Draw a ring around this clown.

"For each of the other pictures, draw lines to match the spools and the toys. Then draw a ring around the correct clown. Remember that you are looking for the pictures that show more toys than spools."

STA 1 page 20
Workbook edition page 29

Idea of "greater than"; introduction of the printed words "is greater than"

The children learn to recognize the printed words "is greater than." Also, for the first time, they encounter placeholders in a mathematical sentence.

A *placeholder* is a symbol in a mathematical sentence that holds a place for the name of a number or an idea. Any symbol can be used as a placeholder. Placeholders such as ?, ■, x, n, and t are used in mathematical sentences such as ■ × 2 = 6 and 8 + x = 10. A placeholder holds a place for a numeral that will correctly complete a sentence. At the grade 1 level, it seems advisable to use the symbols ■ and ● as placeholders. ■ and ● are read "what number." Different placeholders are used because different numerals are needed as replacements. Refer to the first of these symbols (■) as a "square screen" and to the second (●) as a "round screen." Do *not* refer to these placeholders as "the square" and "the circle," as this phraseology will interfere with certain geometric ideas that will be developed later.

Direct attention to the picture of blocks and bells. Have the children decide which of the two sets has more members. They should say that there are more boxes than bells. Then have the children name the number associated with each set and have them say, for example, "4 is greater than 3." Next, using your established reading technique, introduce the printed phrase "is greater than." Have the children read the sentence "4 is greater than 3."

Next, discuss the picture of sailboats and racing cars. Have the children compare the two sets. They should say that there are fewer sailboats than racing cars and that there are more racing cars than sailboats. Have them name the number associated with each set, and proceed as with the picture of blocks and bells.

Follow a similar procedure for each of the other pictures on this page. When discussing the picture of the tops and the ball, introduce the placeholder ■. Explain that the "square screen" holds a place for a numeral. "■ is greater than 1" is read "*what number* is greater than 1." Be sure the children understand that this sentence is related to the picture of the tops and the ball. When discussing the picture of the wheelbarrow and the shovels, introduce the placeholder ● and explain that the "round screen" may also be used to hold a place for a numeral. As the children read the sentences that contain placeholders, have them supply the numerals that correctly complete the sentences.

Provide each child with five cards on which the following symbols are printed: ■, is, greater, than, ● (one symbol on each card). Have the children set up situations that en-

able them to compare sets of objects (for example, 4 red blocks and 1 yellow block). The children can use the cards to build sentences such as "▬ is greater than ● ." Then, using the cards provided for page 18 on which the numerals 1, 2, 3, and 4 are written, have them replace the ▬ and the ● with appropriate numerals.

Do *not* ask how many more objects there are in one set than in the other, or how much greater one number is than the other.

STA 1 page 21
Workbook edition page 30

Idea of "less than"; introduction of the printed words "is less than"

The children continue to use the idea of "less than." They learn to recognize the printed words "is less than," and continue to supply replacements for placeholders in sentences.

Use a procedure similar to that used with *STA 1* page 20 (Wkbk page 29). For the picture of the fire engine and the trucks, the children should understand the following: There are fewer fire engines than delivery trucks; there are more delivery trucks than fire engines; the number 1 is associated with the set of fire engines, and the number 2 is associated with the set of delivery trucks; 1 is less than 2; and 2 is greater than 1. Use your established reading technique to introduce the printed phrase "is less than."

Review the meaning and the use of the placeholders ▬ and ●. For sentences that contain placeholders, be sure to have the children replace the placeholders with numerals that correctly complete the sentences.

Give each child a set of the five cards used previously and a new card on which is printed the word "less." Have children build sentences such as "▬ is less than ● " as well as "▬ is greater than ● ."

Practice tablet page 16
Workbook edition page 31

Direct attention to the picture of the apples and the cupcakes. Have the children look at the sentence they are to complete. Then say: "How many apples are there? [3] How many cupcakes are there? [1] Are there more cupcakes than apples? [No] Are there more apples than cupcakes? [Yes] Is 1 greater than 3? [No] Is 3 greater than 1? [Yes] Now complete the sentence. Write 3 on one response line. Write 1 on the other response line. Be sure your sentence tells the truth about the numbers 1 and 3.

"For each of the other pictures, look at the sentence you are to complete. Decide how many objects there are in each part of the picture. Then complete the sentence by writing the correct numeral on each response line. Be sure that your sentence tells the truth about the numbers you use with the picture. Look at each sentence carefully because the sentences are not alike."

Practice tablet page 17
Workbook edition page 32

Say: "For each of the pictures, look at the sentence you are to complete. Decide how many objects there are in each part of the picture. Then complete the sentence by writing the correct numeral on each response line. Be sure that your sentence tells the truth about the numbers you use with the picture. Look at each sentence carefully because the sentences are not alike."

STA 1 page 22
Workbook edition page 33

Ideas of "greater than" and "less than"

The children continue to study the ideas of "greater than" and "less than." They learn to discriminate between sentences such as "2 is less than 4" and "4 is greater than 2." They also learn about a new placeholder, the wavy line (~~~~).

Use a teaching procedure similar to that used for *STA 1* pages 20 and 21 (Wkbk pages 29 and 30). When discussing the picture of the wagon and the wheelbarrows, introduce the wavy line (~~~~) as a placeholder. The wavy line is used throughout the pupil's book as a placeholder for a word, a group of words, or a symbol. Explain that, on this page, the wavy line is a placeholder for either the phrase "is less than" or the phrase "is greater than." For the sentences "1 ~~~~ 4" and "4 ~~~~ 1," have the children indicate the correct replacement from the list at the top of the page. The colored marks serve as a means of identification. Notice that three of the pictures on this page contain sentences that require replacement of the square screen and the round screen by numerals. The other sentences require replacement of the wavy lines by "is greater than" or "is less than."

Use of this page will vary somewhat, depending on the ability of the class (or group). Children of high ability may need only a brief explanation of the function of the placeholder, and then will be able to respond immediately to the sentences given in each picture.

For the less able children, proceed more slowly. Discuss each picture with them, and let them decide what numerals or words are correct replacements. Have them read each sentence using the correct replacement for each placeholder.

Practice tablet page 18
Workbook edition page 34

Direct attention to the picture of the trucks and the fire engines. Have the children look at the two sentences they are to complete. Then say: "How many trucks are there? [3] How many fire engines are there? [2] Is 3 greater than 2? [Yes] Complete the top sentence. Is 3 less than 2? [No] Is 2 less than 3? [Yes] Complete the bottom sentence.

"For each of the other pictures, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete the two sentences. Be sure each sentence tells the truth about the numbers you use with the picture."

STA 1 page 23
Workbook edition page 35

Introduction of the idea of "equal to"; oral use of the words "is equal to"

The children begin to study the idea of equality. They learn that a set of 3 boxes and a set of 3 balls are equal in number because *the number* of boxes is *the same as the number* of balls.

Sets that can be placed in a one-to-one correspondence have the *same number* of members and are *equivalent* sets. The idea of *equivalence* is related to the correspondence of the members of the sets. The idea of *equality* is related to the number associated with equivalent sets.

Look at the picture of the dolls and the toy irons. A one-to-one correspondence exists between the members of these two sets. The set of dolls is *equivalent* to the set of toy irons. Since the sets are equivalent, the same number is associated with each set. Therefore, the number of dolls *is equal to* the number of toy irons, or 3 is equal to 3. Mathematically, "is equal to" means "is the

same as." It is not correct to say that the set of dolls is equal to the set of toy irons.

The distinction between the ideas of equivalence and equality is rather sophisticated. Keep the distinction in mind but do not introduce the words "equivalent," "equivalence," and "equality" to the children.

Discuss the picture of footballs and toy boats. The children should observe that, since there are more footballs (3) than toy boats (2), 3 is greater than 2. They also should observe that, since there are fewer toy boats than footballs, 2 is less than 3.

Direct attention to the picture of dolls and toy irons. Have them trace each line with their fingers. (Remember that "line" as used here does not relate to the geometric notion of a line.) The children should observe that there is a toy iron for each doll and a doll for each toy iron. Ask the children if there are as many toy irons as there are dolls. They should decide that there are as many toy irons as dolls. They should understand that "greater than" and "less than" do not apply to this situation. Have the children say that there are three dolls and three toy irons. Tell them that, since the number of dolls is the same as the number of toy irons, we say "3 *is equal to* 3."

Follow a similar procedure for the remaining pictures, emphasizing the idea of equality as associated with the numerousness of the two sets being compared.

STA 1 page 24
Workbook edition page 36

Idea of "equal to"; introduction of the printed words "is equal to"

The children continue to work with the idea of "equal to," with mathematical sentences and with placeholders. They learn to recognize and read the phrase "is equal to."

Discuss the picture of stuffed dogs and toy ducks. Have the children decide if there are as many dogs as ducks, more dogs than ducks, or fewer dogs than ducks. They should say that there are as many dogs as ducks. Ask the children to name the number that is associated with each set in a picture, and then have them describe the relationship between the numbers. For the first picture, they should say, "4 is equal to 4." Next, using your established reading technique, introduce the phrase "is equal to." Have the children read the sentence "4 is equal to 4." They should understand that this sentence is related to the picture of stuffed dogs and toy ducks.

Follow a similar procedure for each of the other pictures on the page. When discussing the picture of the toy airplane and the toy truck, remind the children that the square screen (▩) holds a place for a numeral. As the children read the sentence, have them supply the numeral that correctly completes the sentence. Review the use of the round screen (●) as a placeholder when discussing the picture of baseballs and caps.

Notice that for the picture of pans and baskets and for the picture of stuffed elephants and stuffed bears, only one sentence is given. The response for the picture of pans and baskets should be "2 is less than 4." For the picture of elephants and bears, the response should be "4 is greater than 3."

Give each child two additional cards, one with the word "equal" printed on it, the other with the word "to" printed on it. Have the children build (or draw) sets of objects and use their cards to make sentences that are related to the pictures of objects; for example, "3 is equal to 3," "1 is less than 4," and so on.

Practice tablet page 19
Workbook edition page 37

Direct attention to the picture of the cans and the paint jars. Have the children look at the sentence they are to complete.

Then say: "How many cans are there? [3] How many paint jars are there? [3] Are there as many cans as paint jars? [Yes] Is 3 equal to 3? [Yes] Complete the sentence.

"For each of the other pictures, look at the sentence you are to complete. Decide how many objects there are in each part of the picture. Then complete the sentence. Be sure that your sentence tells the truth about the numbers you use with the picture. Look at each sentence carefully because the sentences are not alike."

Practice tablet page 20
Workbook edition page 38

Direct attention to the picture of the wagons and the boats. Have the children look at the two sentences they are to complete. Then say: "How many wagons are there? [2] How many boats are there? [2] Is 2 less than 2? [No] Can you make the top sentence tell the truth about the numbers you use with the picture? [No] Draw a line through this sentence. Is 2 equal to 2? [Yes] Complete the bottom sentence.

"For each of the other pictures, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the picture.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the picture."

STA 1 page 25
Workbook edition page 39

Introduction of the idea of "one less than"; introduction of the number zero

On this page the children learn what is meant by the idea of "one less than." Then they examine the set that has one object fewer than a set of one object and discover that this set is associated with the number zero.

Observe that there are 2 sections on this page. The four two-part pictures in the first section teach the idea of "one less than." The pictures should be used in left-to-right order. The second section (eight single pictures) reinforces the idea just presented. These pictures may be used in any order.

The children are familiar with the idea of "less than." They know that 2 is less than 4, 1 is less than 3, and so on. Now attention is focused on the number that is *one* less than another number.

For the first picture, have children decide that there are fewer wagons than cars and that 3 is less than 4. Then help them use a matching procedure to determine that the set of wagons has one object fewer than the set of cars. Then get them to understand and say that "3 is one less than 4." Proceed in a similar way to establish that 2 is one less than 3 and that 1 is one less than 2.

For the fourth picture, ask the children how many members a set would have if it had one object fewer in it than the set of 1 boat. Ask them if there would be any members in this set. Tell them that the set that has no members is called the *empty set*. Direct attention to the picture that shows the blank space and the boat. Tell them that the blank space represents the set that has no members, or the empty set, and that *zero* is the name associated with this set. Be sure the children understand that zero is the number that is one less than 1. Do not introduce the written word "zero" or symbol "0" at this time. Encourage the children to give examples of the empty set.

Use the pictures at the bottom of the page for practice. Ask the children to find a set that you describe (the set of kites, for example) and to name the number associated with

this set. Then have them find a set (or sets) that has one object fewer than this set. For the set of kites, the children should select the set of balls and the set of tops. For each set selected, they should say "2 is one less than 3."

Be sure that you use "one fewer than" when talking about objects and "one less than" when discussing numbers. However, do not be too critical of the children's language at this early stage. The use of precise language will come after much experience in listening to correct usage.

STA 1 page 26
Workbook edition page 40

Introduction of the idea of "one greater than"; introduction of the number 5

The children now begin their study of the idea of "one greater than." They learn that a set of 5 objects has one member more than a set of 4 objects and that 5 is one greater than 4.

This page also is divided into two sections. There are four two-part pictures and eight separate pictures for practice. The two-part pictures should be used in left-to-right order. The single pictures may be used in any order.

The ideas of "one greater than" and "one less than" are related ideas. If a first number is one less than a second number, then the second number is one greater than the first number. Since the children have studied the use of "one less than," they should have little difficulty with the idea of "one greater than."

Direct attention to the picture that shows 1 drum and the empty set. Ask the children what number is associated with each of these sets. Review the ideas that the empty set has one member fewer than the set of 1 drum and that 0 is one less than 1. Then ask the children how many more objects are in the set of 1 drum than in the empty set. Have them observe that there is one object more in the set of 1 drum than in the empty set and that 1 is one greater than 0. Follow a similar procedure to establish the ideas that 3 is one greater than 2 and that 4 is one greater than 3.

For the picture that shows bells and balloons, have the children identify the number associated with the set of balloons. Ask if anyone knows the name of the number that is one greater than 4. If no one can give the answer, tell them that the name of the number of bells in the set is "five." Have them express this new number as follows: "A set of five has one member *more* than a set of four; 5 is *one greater* than 4." It is important to work slowly and carefully with this page, since it establishes the pattern for subsequent development of the numerousness of sets through 10.

Have the children review the ideas of "one less than" and "one greater than" by building groups of objects on their desks. Emphasize that five is the number associated with the set that has one member more than the set of four.

For the single pictures, have the children find a specified set (for example, the empty set) and name the number associated with this set. Then have them find a set (or sets) that has one member more than the specified set. They could also find a set that has one member fewer than a specified set for all pictures except the one that represents the empty set.

STA 1 page 27
Workbook edition page 41

Determining equivalence; extending the concept of the number 5

The children first decide if there are as many members in a certain set as there are in

a master set. Then they learn that the number 5 is associated with the master set and with all sets that are equivalent to the master set.

Remind the children that the set of colored disks shown in each picture is called the master set.

Direct attention to the picture that shows the master set and the set of umbrellas. Ask the children if there is an umbrella for each disk and if there is a disk for each umbrella. Some children may find it necessary to trace the lines in order to determine the matching. The children should observe that there are as many umbrellas as disks. Avoid saying that there are 5 disks or 5 umbrellas. The main purpose of this page is to develop further the idea of equivalent sets.

Follow a similar procedure with each of the other pictures. Be sure the children observe that there are fewer fire engines than disks and that there are more pails than disks.

After all the pictures have been discussed, identify the master set as having 5 objects. Remind the children that 5 tells how many members there are in the master set and in all sets that have as many members as the master set. Have them identify the number of objects as "five" or "not five." Do not ask the children to name the number associated with the set of fire engines or the set of pails. If they suggest names for these numbers, accept the suggestions, but do not extend the discussion of these names. The important idea to bring out is that since neither of these sets has as many members as the master set, neither set is associated with the number 5.

STA 1 page 28
Workbook edition page 42

Recognition of a set of 5 objects through various groupings and regroupings

The children learn that a set of 5 objects can be regrouped in various ways and that these regroupings make it easier to determine the numerousness of a set.

Look at the picture of tops. The tops have been grouped as a set of 2 and a set of 3. The set of 2 tops is a part of the set of 5 tops. The set of 2 tops is a subset of the set of 5 tops. The set of 3 tops is also a subset of the set of 5 tops. Notice that each member of a subset is also a member of the set. Other examples of subsets are: the set of ducks is a subset of the set of animals; the set of rowboats is a subset of the set of boats.

The children should be able to recognize sets of 1, 2, 3, or 4 objects without regrouping the objects. However, in recognizing the numerousness of sets that have more than 4 objects, they must at some point recognize the subsets within each set. For example, they might recognize a set of 7 objects by seeing a set of 3 and a set of 4. The set of 3 and the set of 4 are subsets of the set of 7. It is important that the children learn to recognize the numerousness of sets by examining the subsets within the set, so that they can recognize the numerousness of sets having 7, 8, 9, or more, members.

Identify the master set as a set of five disks. Direct attention to the picture of tops. First have the children determine that, since there are as many tops as disks, there are 5 tops. Then have them observe that the tops have been grouped as a set of 2 and a set of 3. They should understand that the 2 tops are a part of the set of 5 tops and that the 3 tops are also a part of the set of 5 tops. Tell them that the set of 2 tops is a subset of the set of 5 tops and that the set of 3 tops is also a subset of the set of 5 tops.

Provide each child with five markers. Have the children put these markers on their desks to represent the arrangement of tops. Be sure that they arrange their markers as a set of 2 and a set of 3. Ask them how many markers they have on their desks. Continue with this

activity until the children recognize the numerousness of a set of 5 in terms of subsets, which, in this case, are a set of 2 and a set of 3.

Proceed with the other three pictures in a similar way. The children should observe that the sets are grouped in various ways: 4, 1; 2, 2, 1; 3, 2. Have the children build sets of 5 objects on their desks. They should experiment to discover different ways in which a set of 5 can be regrouped.

The pictures at the bottom of the page may be discussed in any order. Describe a set (the set of dogs, for example) and have the children give the number associated with the set. Finally, ask the children to identify each set of 5 objects and to describe how each of these sets is grouped. By this time the children should be recognizing sets of 5 with a fair degree of ease.

Practice tablet page 21
Workbook edition page 43

Direct attention to the picture of the clocks. Have the children look at the three sets of disks that are shown in the picture.

They say: "Only one of the sets of disks can be matched with the set of clocks. Find this set. Is there a disk for each clock and a clock for each disk? [Yes] Draw a ring around this set of disks.

"For each of the other pictures, find the set of disks that can be matched with the set of objects shown in the picture. Draw a ring around this set."

Some children may have trouble selecting the correct set of disks. If this difficulty arises, show them how to do the matching by drawing a line from an object to a disk.

Practice tablet page 22
Workbook edition page 44

Say: "For each picture, find the set of disks that can be matched with the set of objects shown in the picture. Draw a ring around this set."

STA 1 page 29
Workbook edition page 45

Introduction of printed words and symbols for 5 and 0

The children learn the words and symbols that name the numbers 5 and 0. They also recognize the numerousness of sets with 1 through 5 members and identify the numerals that name the numbers associated with these sets.

Direct attention to the picture of train engines. Have the children decide how many engines there are. Introduce the word "five" and the symbol "5" as names for the number associated with this set. Use your established reading technique in introducing the words and symbols. Then have the children determine that there are as many tank cars as engines and decide how many tank cars there are. Have them select, from the list at the top of the page, the numerals that name the number of tank cars. The colored marks under each numeral can be used as a means of identification. Follow a similar procedure for introducing the word and symbol for 0.

The eight pictures at the bottom of the page may be taken in any order. For each picture, have the children decide what number is associated with each set. Then they should find the word and/or symbol in the list at the top of the page that names the number. Notice that not all the words and symbols that the children have learned are given in the list.

STA 1 page 30
Workbook edition page 46

The printed words and symbols for 0, 1, 2, 3, 4, and 5

The children are given further experiences in recognizing the numerousness of sets and in selecting for each set the numerals that name the number associated with the set.

The pictures may be discussed in any order. For each picture, have the children tell how many objects are in the set and what word and symbol name the number associated with the set. The colored dots can be used as a means of identifying the words and symbols.

Practice tablet page 23
Workbook edition page 47

Call attention to the picture of the cupcakes. Say: "How many cupcakes are there? [5] Find the word that tells how many cupcakes there are. Draw a ring around this word. Find the numeral that tells how many cupcakes there are. Draw a ring around this numeral.

"For each of the other pictures, decide how many objects there are. Draw a ring around the word that tells how many objects there are. Then draw a ring around the numeral that tells how many objects there are."

Practice tablet page 24
Workbook edition page 48

Call attention to the four rows of response lines at the top of the page. Say: "With your pencil, trace the numeral at the beginning of a row. Then write the numeral on each of the other response lines in the row."

Fither before the children begin to work or after they have completed the top four rows, call attention to the exercises at the bottom of the page. Say: "With your pencil, trace a numeral. Then on the response line below it, write the numeral you traced."

Practice tablet page 25
Workbook edition page 49

Direct attention to the picture of the boats. Say: "How many boats are there? [5] On the response line, write the numeral that tells how many boats there are.

"For each of the other pictures, decide how many objects there are. On the response line, write the numeral that tells how many objects there are."

STA 1 page 31

The number 5 - ideas of "greater than," "less than," and "equal to"

The children review the ideas of equality and the ideas of "greater than" and "less than" with special emphasis on the number 5. They also review the use of placeholders and are given more practice with the written words for the phrases "is less than," "is greater than," and "is equal to."

Direct attention to the picture of balls and blocks. Have the children compare the two groups. Remind them to use "fewer" or "more" when discussing objects. They should say that there are fewer balls than blocks; that there are more blocks than balls. Ask them to name the numbers associated with each of the sets. They should understand that the sentences in the picture are related to the two sets of objects and that they should supply the correct numerals as they read each sentence. As the children read "3 is less than 5" and "5 is greater than 3," emphasize that "less than" and "greater than" are used when discussing numbers.

In a similar way discuss the other two-part pictures with the class. After the children give the name of the number associated with each set, have them read each sentence,

supplying the correct words and numerals as they read.

If some children are having trouble, allow them to work with objects at their desks or on a table. They should build sets of objects and then use their cards with words and numerals on them to make sentences that express the comparisons. The children will need cards for "five" and "5" at this point.

Practice tablet page 26
Workbook edition page 50

Direct attention to the picture of the baseballs and the baseball gloves. Have the children look at the two sentences they are to complete. Then say: "How many baseballs are there? [5] How many baseball gloves are there? [3] Is 3 greater than 5? [No] Is 5 greater than 3? [Yes] Complete the top sentence. Is 5 less than 3? [No] Is 3 less than 5? [Yes] Complete the bottom sentence.

"For each of the other pictures, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the picture.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the picture."

STA 1 page 32
Workbook edition page 51

Introduction of the number 6; oral use of the word "six"

The children again study the idea of "one greater than." They learn that 6 is the number that is one greater than 5.

The approach used for this page should be similar to that used for introducing the number 5. For each of the first three pictures, going from left to right, the children should decide what number is associated with each set, which set has more members, how many more members it has, and finally give one of these sentences: "3 is one greater than 2," "4 is one greater than 3," "5 is one greater than 4." Introduce the number 6 as the number associated with the set that has one member more than the set of 5.

For the pictures at the bottom of the page, have the children find a set that you describe (the set of airplanes, for example) and name the number associated with this set. Using the given set, have them find a set that has one object fewer than the given set and a set that has one object more than the given set.

Some children may need more help. Give them time for supervised activities similar to those described earlier. They might work with objects at their desks, or a group of like ability may work together at a table. Some of the more able children could act as "helpers" in the group activity.

STA 1 page 33
Workbook edition page 52

Determining equivalence; extending the concept of the number 6

The children first decide if there are as many members in a given set as there are in the master set. Then they learn that the number 6 is associated with the master set and with all sets that are equivalent to the master set.

Adapt the teaching procedures given for *STA 1* page 27 (Wkbk, page 41) to this page. Remember the number of objects in the master set should not be named "six" until after the page has been discussed.

It is important to understand that as the number of members in a set increases, the difficulty of establishing equivalence (or non-

equivalence) also increases. Give the children all the time they need for the work on this page and use as many class activities with objects as you can. Continue to stress the idea that 6 is the number that is one greater than 5.

STA 1 page 34
Workbook edition page 53

Recognition of a set of 6 objects through various groupings and regroupings

The children learn that a set of 6 objects may be made up of various subsets: a set of 4 and a set of 2; 3, 3; 2, 3, 1; and 2, 2, 2. They begin to recognize a set of 6 by recognizing the subsets of which it is composed. Continue oral use of the word "six."

Adapt the teaching procedures given for *STA 1* page 28 (Wkbk page 42) to the work on this page.

Practice tablet page 27
Workbook edition page 54

Direct attention to the picture of the balls. Have the children look at the three sets of disks that are shown in the picture.

Then say: "Only one of the sets of disks can be matched with the set of balls. Find this set. Is there a disk for each ball and a ball for each disk? [Yes] Draw a ring around this set of disks.

"For each of the other pictures, find the set of disks that can be matched with the set of objects shown in the picture. Draw a ring around this set of disks."

Some children may have trouble selecting the correct set of disks. If this difficulty arises, show them how to do the matching by drawing a line from an object to a disk.

STA 1 page 35
Workbook edition page 55

Introduction of printed word and symbol for 6

The children continue to recognize the numerousness of sets having 6 or fewer than 6 members. They also identify the numerals that name the number associated with each set.

Adapt the procedures suggested for *STA 1* pages 29 and 30 (Wkbk pages 45 and 46) to the work on this page. Remember to proceed slowly. Give the children ample time in which to achieve understanding and a feeling of ease in dealing with the sets of 0 through 6 objects.

Practice tablet page 28
Workbook edition page 56

Call attention to the picture of the wheelbarrows. Say: "How many wheelbarrows are there? [5] Find the word that tells how many wheelbarrows there are. Draw a ring around this word. Find the numeral that tells how many wheelbarrows there are. Draw a ring around this numeral.

"For each of the other pictures, decide how many objects there are. Draw a ring around the word that tells how many objects there are. Then draw a ring around the numeral that tells how many objects there are."

Practice tablet page 29
Workbook edition page 57

Call attention to the two rows of response lines at the top of the page. Say: "With your pencil, trace the numeral at the beginning of a row. Then write the numeral on each of the other response lines in the row."

Either before the children begin to work or after they have completed the top two rows, call attention to the exercises at the bottom of the page. Say: "With your pencil, trace a numeral. Then on the response line below it, write the numeral you traced."

Practice tablet page 30
Workbook edition page 58

Direct attention to the picture of the wheelbarrows. Say: "How many wheelbarrows are there? [2] On the response line, write the numeral that tells how many wheelbarrows there are.

"For each of the other pictures, decide how many objects there are. On the response line, write the numeral that tells how many objects there are."

STA 1 page 36

The number 6 – ideas of "greater than," "less than," and "equal to"

The children continue to work with sets of 6 or fewer than 6 members and with the ideas of "greater than," "less than," and "equal to." They also continue to find replacements for placeholders.

The teaching procedures given for using *STA 1* page 31 may be adapted to the work on this page.

Practice tablet page 31
Workbook edition page 59

Direct attention to the picture of the horns and the bells. Have the children look at the two sentences they are to complete. Then say: "How many horns are there? [6] How many bells are there? [6] Is 6 greater than 6? [No] Can you make the top sentence tell the truth about the numbers you use with the picture? [No] Draw a line through this sentence. Is 6 equal to 6? [Yes] Complete the bottom sentence.

"For each of the other pictures, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the picture.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the picture."

Practice tablet page 32
Workbook edition page 60

Say: "For each picture, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the picture.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the pictures."

STA 1 page 37
Workbook edition page 61

Introduction of the number 7

The children continue to work with the idea of "one greater than." They learn that the number 7 is associated with the set that has one member more than the set of 6. They use the word "seven" orally.

The teaching procedures given for using *STA 1* page 26 (Wkbk page 40) may be adapted to this page. Reinforce the work with many activities that involve objects. Emphasize the idea that a set of 7 has one member more than a set of 6, and that 7 is one greater than 6.

This page (and similar pages) may be used to review the idea of "one less than." Ask: "What number is one less than 5? Than 3? Than 6? Than 7?"

STA 1 page 38
Workbook edition page 62

Determining equivalence; extending the concept of the number 7

The children decide which sets of objects are equivalent to the master set. Then they learn that the number 7 is associated with the master set and with all sets that are equivalent to the master set.

The teaching suggestions given for *STA 1* page 27 (Wkbk page 41) may be adapted to this page. For each picture, give the children ample time to establish whether the set of objects is equivalent to the master set of 7 disks. There are two non-equivalent sets (the set of catcher's mitts and the set of toy bears). Have the children observe that the set of catcher's mitts has more members than the master set and that the set of bears has fewer members than the master set.

STA 1 page 39
Workbook edition page 63

Recognition of a set of 7 objects through various groupings and regroupings

The children learn that a set of 7 objects can be arranged in various ways (3, 4; 2, 2, 2, 1; 3, 2, 2; 3, 3, 1; 4, 2, 1; 4, 3).

The teaching procedures that were suggested for *STA 1* page 28 (Wkbk page 42) may be adapted to this page. Allow ample time for the work on this page. Use as many classroom activities as possible.

Practice tablet page 33
Workbook edition page 64

Direct attention to the picture of the balloons. Have the children look at the three sets of disks that are shown in the picture.

Then say: "Only one of the sets of disks can be matched with the set of balloons. Find this set. Is there a disk for each balloon and a balloon for each disk? [Yes] Draw a ring around this set of disks.

"For each of the other pictures, find the set of disks that can be matched with the set of objects shown in the picture. Draw a ring around this set of disks."

STA 1 page 40
Workbook edition page 65

Introduction of printed word and symbol for 7

The children learn the word and the symbol that name the number 7. They determine the numerousness of sets they have studied and select the numerals that name the number associated with each set.

Direct attention to the picture that shows the spools. Ask how many spools there are. Introduce "seven" and "7" as the names associated with a set of 7 objects. Use your usual reading method. For each of the other pictures, have the children name the number associated with the set of objects. Then tell them to select the word and the symbol that name the number. The colored dots may be used as a means of identification.

Children who need more practice can build sets and use their numeral cards to name the number associated with each set.

Practice tablet page 34
Workbook edition page 66

Call attention to the picture of the boats. Say: "How many boats are there? [6] Find the word that tells how many boats there are. Draw a ring around this word. Find the numeral that tells how many boats there are. Draw a ring around this numeral.

"For each of the other pictures, decide how many objects there are. Draw a ring around the word that tells how many objects there are. Then draw a ring around the numeral that tells how many objects there are."

Practice tablet page 35
Workbook edition page 67

Call attention to the two rows of response lines at the top of the page. Say: "With your pencil, trace the numeral at the beginning of a row. Then write the numeral on each of the other response lines in the row."

Either before the children begin to work or after they have completed the top two rows, call attention to the exercises at the bottom of the page. Say: "With your pencil, trace a numeral. Then on the response line below it, write the numeral you traced."

Practice tablet page 36
Workbook edition page 68

Direct attention to the picture of the wheels. Say: "How many wheels are there? [7] On the response line, write the numeral that tells how many wheels there are.

"For each of the other pictures, decide how many objects there are. On the response line, write the numeral that tells how many objects there are."

STA 1 page 41

The number 7 - ideas of "greater than," "less than," and "equal to"

The children discover that 7 is equal to 7, that 7 is greater than each of the other numbers studied so far, and that each of the other numbers studied so far is less than 7.

The teaching suggestions for *STA 1* page 31 may be adapted to this page. Remember that numerals replace the square screen (▬) and the round screen (●). Words replace the wavy line (~~~~~).

Children who need more practice should build sets of objects with 7 or fewer members and then use their cards to express comparisons of the numbers associated with the sets in terms of "greater than," "less than," or "equal to." They will need cards for "seven" and "7."

Practice tablet page 37
Workbook edition page 69

Direct attention to the picture of the airplanes and the whistles. Have the children look at the two sentences they are to complete. They say: "How many airplanes are there? [2] How many whistles are there? [7] Is 2 less than 7? [Yes] Complete the top sentence. Is 2 greater than 7? [No] Is 7 greater than 2? [Yes] Complete the bottom sentence.

"For each of the other pictures, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the pictures.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the picture."

Practice tablet page 38
Workbook edition page 70

Say: "For each picture, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the picture.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the picture."

STA 1 page 42
Workbook edition page 71

Introduction of the number 8

The children learn that the number 8 is associated with the set that has one member more than a set of 7.

Review with the children what they have learned so far -- that 7 is one greater than 6, that 6 is one greater than 5, that 5 is one greater than 4, and so on. Then discuss the first three pictures on this page.

When the children have decided that the set of tops has one member more than the set of 7 balls, tell them that the number 8 is associated with the set that has one member more than a set of 7 objects and that 8 is one greater than 7. Then proceed as you did for the introduction of the numbers 5, 6, and 7. Give the children many opportunities to build sets of 8 objects and compare them with sets of 7 objects.

STA 1 page 43
Workbook edition page 72

Determining equivalence; extending the concept of the number 8

The children continue to study the number 8. They learn that all sets that are equivalent to the master set are equivalent to each other, and that the number 8 is associated with each of these sets.

The teaching suggestions given for *STA 1* page 27 (Wkbk page 41) may be adapted to this page.

STA 1 page 44
Workbook edition page 73

Recognition of a set of 8 objects through various groupings and regroupings

Through the work on this page, the children learn that a set of 8 objects can be grouped in different ways (4, 4; 3, 3, 2; 2, 2, 2, 2; 4, 3, 1).

The teaching suggestions given for *STA 1* page 28 (Wkbk page 42) may be adapted to this page. By now the children should be reasonably adept in recognizing the possible subsets. Allow the children to use various objects to show sets of 8. Have them regroup the objects in as many ways as they can discover. Some children may show such arrangements as 6, 2; as 7, 1; or as 5, 3. These arrangements are certainly acceptable, but make sure that the children who show these arrangements understand why they used them.

Practice tablet page 39
Workbook edition page 74

Direct attention to the picture of the blocks. Have the children look at the three sets of disks that are shown in the picture.

Then say: "Only one of the sets of disks can be matched with the set of blocks. Find this set. Is there a disk for each block and a block for each disk? [Yes] Draw a ring around this set of disks.

"For each of the other pictures, find the set of disks that can be matched with the set of objects shown in the picture. Draw a ring around this set of disks."

STA 1 page 45
Workbook edition page 75

Introduction of printed word and symbol for 8

The children learn the word and the symbol that name the number 8. They also review the numerals that express the other numbers they have studied and practice recognition of sets that have 8 or fewer than 8 objects.

Have the children decide that the set of whistles has 8 members. Introduce "eight" and "8" as names for the number 8. Use your usual reading technique. Ask the children to find all the sets pictured that are equivalent to

the set of 8 whistles (the set of irons, the set of purses, the set of spools).

Then, for each picture, have the children determine the number of objects in the set and have them identify the printed word and symbol that name the number. Use the colored dots as a means of identification, if necessary. For children who need more help, have them build (or draw pictures of) sets of objects in various arrangements and use their numeral cards to identify the sets.

Practice tablet page 40
Workbook edition page 76

Call attention to the picture of the clocks. Say: "How many clocks are there? [8] Find the word that tells how many clocks there are. Draw a ring around this word. Find the numeral that tells how many clocks there are. Draw a ring around this numeral.

"For each of the other pictures, decide how many objects there are. Draw a ring around the word that tells how many objects there are. Then draw a ring around the numeral that tells how many objects there are."

Practice tablet page 41
Workbook edition page 77

Call attention to the two rows of response lines at the top of the page. Say: "With your pencil, trace the numeral at the beginning of a row. Then write the numeral on each of the other response lines in the row."

Either before the children begin to work or after they have completed the top two rows, call attention to the exercises at the bottom of the page. Say: "With your pencil, trace a numeral. Then on the response line below it, write the numeral you traced."

Practice tablet page 42
Workbook edition page 78

Direct attention to the picture of the apples. Say: "How many apples are there? [8] On the response line, write the numeral that tells how many apples there are.

"For each of the other pictures, decide how many objects there are. On the response line, write the numeral that tells how many objects there are."

STA 1 page 46

The number 8 - ideas of "greater than" and "less than"

The children compare the number 8 with other numbers in terms of "greater than" and "less than." They complete mathematical sentences by supplying words and numerals that replace the wavy line (~~~~), the square screen (▦), and the round screen (◍).

For each picture, have the children decide what number is associated with each set. Then have them read each sentence, supplying the words or numerals that correctly replace the placeholders. Remember to use "more" and "fewer" when discussing sets of objects; "greater" and "less" when discussing numbers.

Continue the work with sets of objects as well as the numeral and word cards for children who need more help. They will need cards for "eight" and "8."

Practice tablet page 43
Workbook edition page 79

Call attention to the picture of the racers and the truck. Have the children look at the two sentences they are to complete. Then say: "How many racers are there? [8] How many trucks are there? [1] Is 8 equal to 1? [No] Can you make the top sentence tell the truth about the numbers you use with the

picture? [No] Draw a line through this sentence. Is 1 greater than 8? [No] Is 8 greater than 1? [Yes] Complete the bottom sentence.

"For each of the other pictures, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the picture.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the picture."

Practice tablet page 44
Workbook edition page 80

Say: "For each picture, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the picture.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the picture."

STA 1 page 47
Workbook edition page 81

Introduction of the number 9

The children learn that 9 is the number associated with the set that has one member more than the set of 8. They use the word "nine" orally as a name of the new set.

Observe that this page reviews the "one greater than" idea, beginning with "6 is one greater than 5," and proceeding through "7 is one greater than 6," and "8 is one greater than 7." The children should discover that the set of whistles has one member more than the set of 8 tops. Tell them that 9 is the number that is associated with the set of whistles.

In discussing the pictures at the bottom of the page, ask the children to see if any set has one member more than a set of 8 (the set of jacks).

Give the children opportunities to identify sets of 9 objects that you show them. They should do this by matching each member with a member of a set of 8, discovering that the new set has one member more, and then giving the name of the number associated with the new set.

STA 1 page 48
Workbook edition page 82

Determining equivalence; extending the concept of the number 9

The children first decide if there are as many objects in a set as in the master set. Then they learn that the number 9 is associated with the master set and with all equivalent sets.

The teaching procedures given for *STA 1* page 27 (Wkbk page 41) may be adapted to this page. Be sure to have the children observe and build sets of 9 objects, and establish the fact that all such sets are equivalent sets.

STA 1 page 49
Workbook edition page 83

Recognition of a set of 9 objects through various groupings and regroupings

The children learn that there are many ways of regrouping a set of 9 objects. They learn to recognize the numerousness of a set of 9 by "seeing" subsets of 3, 3, 3; of 4, 4, 1; of 3, 2, 4; and of 2, 2, 2, 1.

The teaching suggestions given for *STA 1* page 28 (Wkbk page 42) may be adapted to this page. Allow the children to build sets of 9 and to show as many arrangements of subsets as they can. If a child shows 9 as 6, 3, as 5, 4, as 7, 2, or as 8, 1, be sure he can identify the subsets 8, 7, 6, and 5 by giving the names of the lesser subsets.

STA 1 page 50

Recognition of a set of 9 objects through various groupings and regroupings - extended

Adapt the procedures used for *STA 1* page 49. Use the eight pictures at the bottom of the page for practice in recognizing the numerousness of sets.

Practice tablet page 45
Workbook edition page 84

Direct attention to the picture of the lollipops. Have the children look at the three sets of disks that are shown in the picture.

Then say: "Only one of the sets of disks can be matched with the set of lollipops. Find this set. Is there a disk for each lollipop and a lollipop for each disk? [Yes] Draw a ring around this set of disks.

"For each of the other pictures, find the set of disks that can be matched with the set of objects shown in the picture. Draw a ring around this set of disks."

STA 1 page 51
Workbook edition page 85

Introduction of printed word and symbol for 9

The children learn to read the numerals that name the number 9. They also review recognition of sets of objects through 9 and the numerals for the numbers associated with these sets.

Present "nine" and "9" as names for the number 9. Use your usual reading technique. Discuss the other pictures on the page in any order. For each picture, have the children give the number associated with the set and identify the numerals that name this number.

Practice tablet page 46
Workbook edition page 86

Call attention to the picture of the blocks. Say: "How many blocks are there? [9] Find the word that tells how many blocks there are. Draw a ring around this word. Find the numeral that tells how many blocks there are. Draw a ring around this numeral.

"For each of the other pictures, decide how many objects there are. Draw a ring around the word that tells how many objects there are. Then draw a ring around the numeral that tells how many objects there are."

Practice tablet page 47
Workbook edition page 87

Call attention to the two rows of response lines at the top of the page. Say: "With your pencil, trace the numeral at the beginning of a row. Then write the numeral on each of the other response lines in the row."

Either before the children begin to work or after they have completed the top two rows, call attention to the exercises at the bottom of the page. Say: "With your pencil, trace a numeral. Then on the response line below it, write the numeral you traced."

Practice tablet page 48
Workbook edition page 88

Direct attention to the picture of the boats. Say: "How many boats are there? [8] On the

response line, write the numeral that tells how many boats there are.

"For each of the other pictures, decide how many objects there are. On the response line, write the numeral that tells how many objects there are."

STA 1 page 52

The number 9 - ideas of "greater than," "less than," and "equal to"

The children study the ideas of "greater than," "less than," and "equal to," with emphasis on the number 9.

The pictures may be used in any order. For each picture have the children decide what number is associated with each set. Then have them supply the words or numerals that correctly complete the sentences and read each sentence.

As before, have the children build sets (through 9) and use their numeral cards and word cards to make sentences that compare the sets. Cards for "nine" and "9" will be needed.

Remember to use "more" and "fewer" when discussing objects; "greater than" and "less than" when discussing numbers.

Practice tablet page 49
Workbook edition page 89

Call attention to the picture of the candy canes and the cupcakes. Have the children look at the sentences they are to complete. Then say: "How many candy canes are there? [5] How many cupcakes are there? [9] Is 5 greater than 9? [No] Is 9 greater than 5? [Yes] Complete the top sentence. Is 9 less than 5? [No] Is 5 less than 9? [Yes] Complete the bottom sentence.

"For each of the other pictures, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the picture.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the picture."

Practice tablet page 50
Workbook edition page 90

Say: "For each picture, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the picture.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the picture."

STA 1 page 53
Workbook edition page 91

Introduction of the number 10

The children use the idea of "one greater than" to discover a set that has one member more than a set of 9. They learn that 10 is the number associated with this new set.

The pictures at the top of the page review the idea of "one greater than," beginning with "7 is one greater than 6." When the children find the set that has one member more than the set of 9, tell them that 10 is the number for this set. Have them say "A set of 10 has one object more than a set of 9 objects. Ten is one greater than 9." Have them find the set of objects pictured at the bottom of the page that is equivalent to the set of 10 whistles (the set of marbles).

The children should build sets of 9 and of 10 (one more than 9). Encourage them to verbalize the comparison of sets of 9 and 10.

STA 1 page 54
Workbook edition 92

Determining equivalence; extending the concept of the number 10

The children continue to study sets of 10 and to use the word "ten" orally. They learn that any set of 10 is equivalent to all other sets of 10.

The procedures that you have been using to present equivalent sets of 5 through 9 are suitable for introducing the set of 10. Make sure the children understand that all sets that are equivalent to a master set of 10 are equivalent sets. Have the children build (or draw a picture of) a master set of ten and then show the correspondence between the members of this set and the members of several other sets of different kinds of objects.

STA 1 page 55
Workbook edition page 93

Recognition of a set of 10 objects through various groupings and regroupings

The children study various subsets of a set of 10 and learn to "see" this set as 4, 4, 2; as 2, 3, 3, 2; as 3, 4, 3; as 2, 2, 2, 2, 2; as 3, 3, 4; and as 4, 2, 4. They continue to use the word "ten" orally.

Have the children decide that each of the first six sets pictured is equivalent to a master set of 10, that each of these sets is equivalent to each of the other sets, and that the number 10 is associated with each set.

Help the children discover various subsets of the set of 10. Have them use objects to show all the subsets of 10 that they can find. They should understand that it does not matter how they "see" a set of 10, but what does matter is that they recognize the numerousness of the set and use its correct name when discussing it.

STA 1 page 56

Recognition of a set of 10 objects through various groupings and regroupings - extended

Continue the procedures used for *STA 1* page 55. Use the pictures at the bottom of the page for practice in recognizing the numerousness of sets.

Practice tablet page 51
Workbook edition page 94

Direct attention to the picture of the pieces of candy. Have the children look at the three sets of disks that are shown in the picture.

Then say: "Only one of the sets of disks can be matched with the set of pieces of candy. Find this set. Is there a disk for each piece of candy and a piece of candy for each disk? [Yes] Draw a ring around this set of disks.

"For each of the other pictures, find the set of disks that can be matched with the set of objects shown in the picture. Draw a ring around this set of disks."

STA 1 page 57
Workbook edition page 95

Introduction of printed word and symbol for 10

The children learn the word and the symbol that name the number 10. They practice recognition of the numerousness of sets of 10 or fewer objects, and they identify the numerals that name the numbers associated with these sets.

Introduce the word "ten" and the numeral 10. Use your usual reading technique. Use the remaining pictures on the page in any order. For each picture, the children should name the number associated with the set and identify the word and the symbol that name the number.

Practice tablet page 52
Workbook edition page 96

Call attention to the picture of the tops. Say: "How many tops are there? [9] Find the word that tells how many tops there are. Draw a ring around this word. Find the numeral that tells how many tops there are. Draw a ring around this numeral.

"For each of the other pictures, decide how many objects there are. Draw a ring around the word that tells how many objects there are. Then draw a ring around the numeral that tells how many objects there are."

Practice tablet page 53
Workbook edition page 97

Call attention to the two rows of response lines at the top of the page. Say: "With your pencil, trace the numeral at the beginning of a row. Then write the numeral on each of the other response lines in the row."

Either before the children begin to work, or after they have completed the top two rows, call attention to the exercises at the bottom of the page. Say: "With your pencil, trace a numeral. Then on the response line below it, write the numeral you traced."

Practice tablet page 54
Workbook edition page 98

Direct attention to the picture of the marbles. Say: "How many marbles are there? [10] On the response line, write the numeral that tells how many marbles there are.

"For each of the other pictures, decide how many objects there are. On the response line, write the numeral that tells how many objects there are."

STA 1 page 58

The number 10 - ideas of "greater than," "less than," and "equal to"

The children continue to recognize sets with 10 (or fewer) members. They also complete mathematical sentences by supplying the numerals or words that replace the placeholders.

For each picture, have the children decide what number is associated with each set. Then have them decide which number is greater than (or less than) the other number. Then have them read and complete the sentences printed in the picture, supplying the words or numerals needed as replacements.

Less able children may need to supplement this work with sets of objects and the word and numeral cards. Cards for "ten" and "10" will be needed.

Practice tablet page 55
Workbook edition page 99

Call attention to the picture of the pieces of candy and the corks. Have the children look at the sentences they are to complete. Then say: "How many pieces of candy are there? [8] How many corks are there? [10] Is 10 less than 8? [No] Is 8 less than 10? [Yes] Complete the top sentence. Is 8 greater than 10? [No] Is 10 greater than 8? [Yes] Complete the bottom sentence.

"For each of the other pictures, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the picture.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the picture."

Practice tablet page 56
Workbook edition page 100

Say: "For each picture, look at the sentences you are to complete. Decide how many objects are shown in each part of the picture. Then complete each sentence that will tell the truth about the numbers you use with the picture.

"For some pictures, you will complete both sentences. For others, you will complete only one. Draw a line through a sentence if you cannot make it tell the truth about the numbers you use with the picture."

STA 1 page 59

Recognition of the numerousness of sets; ideas of "greater than," "less than," and "equal to"

The children review their knowledge of the numbers 0 through 10, of the numerousness of sets through 10, and of the symbols that name the numbers involved.

Use the pictures in any order. For each picture, the children should first decide what number tells how many members are in the set. Then, from the numerals printed in the picture, they should select the numeral that names the number associated with the set. If you are not sure a child recognizes the numerals, have him hold up the appropriate numeral card as a response.

Use these pictures also to review the ideas of "greater than," "less than," and "equal to." For example, say: "Which set has 10 for its number?" [The jacks and the hats] "What number is 1 less than 10?" [9] "Which set has this number?" [The tank cars] "Which sets have fewer members than the set of jacks? Which have more members?" "What number is one less than 9?" [8] "Which set has this number?" [The cars] Do the same for the "one greater than" idea. Make this review as comprehensive as time permits.

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